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ABSTRACT

A college-level course in technical writing can provide a unique opportunity for the nontechnical student to become acquainted with many facets of the technical world. Such knowledge is especially important to the liberal arts major because the number, scope, and impact of technological developments increase daily. Such a course would be based on the rhetorical principles which (1) describe things and actions; (2) logically classify, divide, and define reality and the terms used to present it; and (3) reliably evaluate and interpret relevant facts and opinions. The course should also train students in skills common to discursive and creative prose and poetry. Students in such a course should have the advantages of being able to apply rhetorical principles to concrete reality and to comprehend technological writing of various kinds. (JM)

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What Can a Technical Writing Course Offer the Non-technical Student?

Marion K. Smith

The tune I will be piping for the next few minutes is a fairly mild one, and it suffers from the same paradox as a sermon on church attendance--those who need it aren't here to listen, and those who are here really don't need the message. But if I pipe it clearly enough, it may echo around long enough to produce some needed conversion.

My basic proposition is that a well-structured course in technical writing need not be restricted to students in engineering, the practical arts, and the "hard" sciences. I grant the danger of supposing it can be all things to all students, and I am not about to suggest that it should be a required course for every college student. At Brigham Young University we offer the student a choice of four courses to complete his composition requirement, each course being tailored for a particular group of majors. I have been teaching one of the other three courses for several years along with technical writing and would vigorously oppose any move to make technical writing the sole option available. Fortunately, our technical writing staff believes in peaceful co-existence.

But while I don't believe technical writing is a universal pain-killer, I do believe that too many students who could profit from it are discouraged from enrolling in it (sometimes quite bluntly). The general attitude of students, faculty, administrators, and interested bystanders is that a

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technical writing course is totally irrelevant to the needs of students who don't manipulate slide rules, test tubes, or dynamometers. When a dramatic arts major or a pre-law student asks whether the course has anything to offer him, it is easy for even a teacher of technical writing to endorse the view of irrelevancy and send him away. Let me offer an alternative view that you can offer fellow faculty members, the administrative powers in charge of registration, and the student himself when the question arises: "What, if anything, can a technical writing course offer the non-technical student?"

I maintain that the course can provide almost any liberal arts major with a significant body of useful knowledge as well as a set of skills that will not only assist him in his own field but may also be directly marketable. With the national economy being what it is, that last consideration is not to be taken lightly.

Let's first consider the knowledge it can provide.

If our hypothetical student is to consider himself truly educated by the time he gets his degree, he needs to have a general awareness of what lies beyond the bounds of his own field of study. Most institutions have some type of general education program, but even the best of these falls short of the ideal. I see the technical writing course as a unique opportunity for the non-technical student to see how the other half of the academic world lives. The course I teach culminates in a major report from each student and an evaluation of that report by some other student in the class. During the evaluation period, each student gives an oral report to the class on some aspect of the topic he treated in his written report. For many students, these final assignments constitute an eye-opening experience--either because they had had no adequate idea of what was going on in the

field written about or because they had assumed it would be difficult or impossible to comprehend material lying outside their immediate areas of interest and knowledge. In some respects the gap between the technical and the non-technical world is as large as the much-talked-about generation gap of recent memory.

Let me suggest the size of that gap indirectly by a comparison of three technical papers I received recently (under circumstances that ruled out much chance of collaboration). The first (from a Chemical Engineer) began:

"All life's processes being obviously chemical, it follows that"

The second (from an Electrical Engineer) opened:

"Because the basic processes of life are all electrical, we can see"

The third (from a Mechanical Engineer) started with this proposition:

"Since all life processes are clearly mechanical in nature"

I haven't received the basic premise of the Civil Engineers yet, but I expect one will be forthcoming. While these examples may be seen as an argument for having the course taught by an impartial language specialist rather than by one of the vested interests of the engineering world, my present concern is with the non-technical student. If we can get that much difference in basic outlook among engineers, how much greater difference in initial premises exists between these engineers and the other students on campus? How important is it for them to be aware of that difference?

The sheer number of people directly involved in science and technology is reason alone why our liberal arts man would do well to know something about what is going on over the fence. I haven't attempted a body count, but I frequently hear that 90% of all the scientists who have ever lived are alive at the present time. If the figure is anywhere near accurate, that

gives the present time a significant dimension that needs very close consideration by anyone wishing to believe himself adequately educated. Such a number also suggests the very high degree of specialization we have reached and the consequent compartmentalization of our society. Fourtunately, the pendulum of our educational systems is swinging back from an over-emphasis on specialization. Our concern for developing analysts and specialists having abated somewhat, we can now see more clearly the need for synthesists and generalists as President Lyman pointed out in an address to the alumni of Stanford University:

> Even if one takes a narrowly vocational view, I think a powerful argument can be mounted in support of the proposition that the future is not going to fall into the hands of the specialist. On the contrary, for the very reason that specialization has gone as far as it has, the need for generalists has never been greater. (National Observer, 16 June 1973)

The liberal arts major has much more than an academic need to be informed about science and technology. Beyond just being aware that it is there, he needs to be prepared to cope with it because of its increasingly greater impact on him and his society. In every direction we see actual or potential technological developments that either are revolutionizing society already or clearly have the capacity to do so. In the words of one of my perceptive colleagues, "one who fails to become the master of technology is fated to become its victim or its slave." Whether we like it or not, technology can save us or destroy us along with the world we inhabit. One may debate the ethics of gunboat diplomacy without a significant knowledge of ordnance or hydraulics, but if he is to mount a successful challenge to the gunboat itself, he had better know how the thing works.

If this were the Middle Ages and our scientists and engineers merely impotent alchemists harmlessly engaged in the transmutation of base metals,

then we might safely remain ignorant of their objectives, their methods, and their potential. But that potential has already mushroomed into such gigantic proportions that there is doubt in many perceptive minds as to whether we can survive, collectively or individually, through the end of the present century. Ten years ago I heard a qualified military authority say that the world's supply of nuclear weaponry had reached the equivalent of sixteen tons of dynamite for every man, woman, and child then alive and was growing rapidly. Population has increased somewhat in the last ten years, but I doubt if it has reduced that awful ratio.

Lest I be suspected of crusading for some ban-the-bomb movement, let me point out that nuclear warfare is simply the most spectacular evidence of our increasing envelopment by and dependence on technology. A pertinent comment on that point was made about eight years ago by the commencement speaker at Newark College of Engineering who asserted that the development of television had already had a greater impact than the Declaration of Independence on the development of world civilization. I recall observing a mild furor at my institution over the lack of humanitarian idealism in that address, but I don't recall anyone seriously attempting to disprove the assertion.

If nuclear weaponry seems too remote or exotic to evaluate properly and the television set too near and common to respond to objectively, then we may consider some of the other ways that technology is reforming our social structures and even our own minds and bodies. In the late 1940's the Army occasionally made some non-military news by its use and development of an enormous assembly of electronic circuitry known as ENIAC (a subsequent model being called MANIAC). In the last three decades we have seen such enormous complexes shrink in size but grow in capability. The Army required a small

warehouse for its ENIAC, and the thing cost millions. Hewlett-Packard asks only $795 for its HP-65 computer which is more sophisticated than ENIAC and is small enough to fit in a coat pocket. Fifty complete programs for that HP-65 will fit into a shirt pocket. Certainly a nation with a large number of its citizens armed with HP-65's has a considerable practical advantage over another in its attempts to deal with its physical and economic environment. I haven't purchased a pocket calculator yet (though they are now available for $10.98), but I soon will. I'm becoming rather defensive about the fact that almost everyone I do business with lately can whip one out and put himself in position to take advantage of me. Put that situation on a cultural or national level and you can imagine the consequences.

Just as it takes money to make money, technological advantage breeds further technological advantage (and technological dependence). Nobody should need to be told of the importance of technology in enabling the numerically insignificant Europeans to obtain and sustain the level of global domination that shaped the modern world, but I still see the significance of technology being vastly underestimated. In the past two years, for example, the industrialized nations have become much concerned over the economic consequences of the jump in petroleum prices. There is considerable cause for concern, but I think the concern is generally short-sighted. It shouldn't take a crystal ball to see that the petrodollars flowing into the oil-producing nations are going to come back out somewhere and that one of the largest outlets will result from the Arab desire for western technology. Massive purchase of western technology is guaranteed to result in massive introduction of western culture. Does anyone seriously believe that the native languages can expand overnight to accommodate the need the Saudi's have, for instance, to handle the fleet of Northrup F-5 warplanes we have

sold them? Even if only the English language accompanied the importation of American technology, there would be some remarkable changes in the offing. Once the western camel gets its technological nose under the tent of Arab culture, there will be no keeping the camel out. It remains to be seen how successfully the Islamic religion can ride out the disturbance.

Other religions also have cause for concern. In his provocative book, We Are Not Alone (1964,1966), Walter Sullivan explores the dead seriousness of past and present efforts to discover and communicate with intelligent life assumed to exist elsewhere in the universe and concludes:

> The current awakening of mankind to the possible existence of intelligent life in other worlds is as much a challenge to established ways of thought as was the Copernican revolution that displaced the earth from the center of the universe. The latter set in motion a religious and philosophical upheaval that only in recent decades has run its course. (rev. ed., p. 276)

Regardless of the potential impact, the search goes on energetically by means of radio messages and notes attached to various vehicles launched into space. Just recently, Time magazine reported a message being beamed to Messier 13 from the giant radio-telescope in Aricebo, Puerto Rico at a range of 24,000 light years (which prompted some wag to comment in a subsequent issue that 24,000 years out and 24,000 years back added up to 48,000 years--a long time to wait for a busy signal).

Closer to home and at the personal level we need to note what is already happening and likely to happen if research and development continue in the area of human biology. We have seen some newsworthy success in the transplantation of human organs, but how aware are we of the implications? We have seen considerable progress in the development of artificial eyes that really see and of all sorts of prosthetic devices such as the Boston arm for amputees. Hopefully, such progress points to some sort of better life for

the individuals involved, but it certainly points to a different sort of life for entire societies. When artificial hearts are finally perfected to a practical level, will it really be unreasonable to expect their manufacture and repair to overshadow the auto industry in terms of GNP and number of people employed?

The whole area of biological engineering has already created thorny problems for lawyers, teachers, ministers, and psychiatrists. Gordon Rattray Taylor, in his pop-science book, The Biological Time-Bomb (1968) and Watson Fuller, in his more scholarly anthology, The Biological Revolution (1971), have given us sobering views of the potential we clearly possess for altering the physical and mental structure of humans in ways that make Brave New World seem a study in British reserve. Artificial insemination of humans has alone created all sorts of confusion about the legal and social status of children conceived by it (and about the corresponding status of the parents). When an egg can be taken from one uterus, fertilized in the laboratory with semen from an anonymous donor, and grown to maturity in the womb of a woman who has never met either of the actual progenitors, you have legal and ethical problems sufficient to cause Solomon to reach for Excedrin. Unless our future lawyers, judges, psychologists, ministers, and social workers gain an awareness of such developments now, they are unlikely to provide us with viable solutions in the future. And if they are unprepared to deal with such problems at the personal level, how much less prepared will they be to deal with the sweeping social adjustments that will be upon us if anyone succeeds in removing the last obstacle to the harnessing of hydrogen fusion? (I'm told that a gallon of sea water has enough easily extractable deuterium in it to equal 356 gallons of gasoline, and that the construction of the right kind of magnetic "bottle" to contain the fusion process would mean virtually

free power for all the nations of the earth for at least a billion years.)

Now I realize how easy it is to become enamored with the need to see the character and direction of movement of our expanding technology and forget that the purpose of this discussion is to establish t.e potential of a college-level course in technical writing. Even though we can bring our students into profitable contact with a variety of technical disciplines, the course is not primarily a course in technology itself. It would be manifestly absurd to suppose that any course in writing is going to make anyone an instant expert in any scientific or technological area. But the best single thing we can do to enable our students to deal with this expanding technology is to provide them with some mastery of the language it conducts its business in--and that means more than merely adding such terms as "critical mass," "CRT," "CPU," "pulsar," "cloning," and "torus" to his technical vocabulary. We can't produce Sam Johnson's capable of encompassing the world's knowledge, but we can offer a passing familiarity with a variety of fields and develop enough mastery of language skills to help one cope with his compartmentalized world.

The skills we can develop in the non-technical student are more immediately valuable than the technological awareness we can offer because they are universally negotiable and can markedly improve his control of his own area of specialty. Very simply what we can offer him is some distinct improvement in his ability to read and write regardless of the subject matter involved.

A technical <u>writing</u> course is not primarily a <u>reading</u> course (at least not the way it is taught at my school), and I don't see any point in pretending that we can compete with Evelyn Wood's Reading Dynamics or any other organized method of teaching reading directly, but I do submit that once a person has learned to <u>write</u> the stuff we call technical writing, he is very likely to note improvement in his ability to understand his technical <u>and</u>

non-technical reading material. He should be better able to digest a newspaper, a novel, a play, or a news broadcast--or to recognize the offering as essentially indigestible as well as unpalatable. In the immediate sense, we want to improve the capacity of our student to cope with matter already written, but ultimately we also want to improve reading by upgrading the quality of the millions of books, articles, and washing-machine operating instructions yet to be written--to the point that they can be read and understood by a person who isn't already familiar with the matter being explained.

Let me concede at this point that a course based primarily on report types and specialized formats isn't going to be of much help for the non-technical student. The course I am advocating is one based on rhetorical principles--those principles needed to describe things and actions; to logically classify, divide, and define reality and the terms used to present it; and to reliably evaluate and interpret relevant facts and opinions. Such a course will train the student in skills that are common to discursive and creative prose (and even poetry). It will emphasize such matters as point of view (as in the orientation required for effective description of apparatus), suitability of structure, levels of abstraction and generality, verbal and graphic illustration, appropriateness of format, and adaptation to specified audiences. Now these rhetorical priniples can be taught in any composition course, but we have a subject-matter advantage of being able to apply them to concrete reality to a degree that other courses cannot. If there is a question about the reliability of technical description, we have recourse to tape measures and balance scales to resolve it. If there is question about the reliability of technical classification or division, we can frequently count, dismantle, or rearrange the physical counterparts of the terms used as a practical means of testing or illustrating the accuracy and organization

of what is asserted.

Let me illustrate the potential for the development of writing skills with samples of proposals my students have given me for the term reports they plan to produce this semester:

#1 (from a student with an undeclared major):

> The proposed topic of my paper deals with the King and Queen Conchs (Stiombus Gigas), sea snails found in the Tropical Atlantic. The paper will cover only this small portion of the Gastropoda Family and will cover these areas: 1) Location of King and Queen Conchs--where they are found. 2) Habitat--the type of place they inhabit, for example, warm or cold water, deep sea or near shore, attached to rocks, free-floating, or resting on the bottom. 3) Behavior--what they eat, how they reproduce, grow, move, fight, obtain food, and survive within their individual communities as well as with other species.

Obviously this student will need some help to narrow and focus the paper so that it will have significant depth and purpose, but we do have a topic that will allow adequate measurement of the student's progress. Either the conch family can be divided conventionally into King and Queen varieties or it cannot. If it cannot, then the student must go back to reliable sources of information to further digest and synthesize the facts before attempting to communicate them to others.

#2 (from an English major):

> The subject I am planning to treat is the use of predatory insects in combatting gardening pests. I will talk about the value of using natural predators in gardening; about their advantages and disadvantages. This will be very broad, but after this background I will narrow the report to the discussion of one insect: the Green Lacewing.

This student will need help in defining the purpose of the paper and properly subordinating one of the two main concerns to the other. Otherwise, the report will leave the reader wondering whether the Green Lacewing is being presented as a specific illustration of the general treatment of predators or whether the general treatment of predators is being given only as a means of producing a better understanding of the Green Lacewing.

#3 (from a non-degree seeking graduate student who quit his job as a high school art instructor to devote full time to the production of a biography of a local sculptor--and found himself deficient in the writing skills needed to do justice to the project):

I am interested in submitting an article on the subject of Cyrus E. Dallin, the Springville sculptor, who became internationally famous for his sculpture works of Indian subjects and the Paul Revere statue in Boston which is of central interest in this bicentennial year. I am writing a rather definitive biography-catalog on Dallin and am aware that the subject is much too large for the assigned report so will narrow it to the technical aspects of Dallin's sculpture methods, materials, types, and subjects.

Since submitting his proposal this last student has seen the need to define his purpose and audience and now intends to focus his report on the sculptor's methods and materials as part of a museum guide to the man's works.

You will notice that these proposals contain several problems that must be resolved if the students involved are to develop their topics into top-quality reports, but hopefully you will also notice that each of these students is coming to grips with tangible reality in an immediate and practical sense that will allow instructor and student to check the developing report against the discussed reality and agree on just where and how it is succeeding or failing to communicate what is desired. While each of these proposed topics requires an individual approach, each will require the establishing of some specific relationships between writer and subject matter, reader and subject matter, and writer and reader; each will require the establishing of coordinate and subordinate relationships of parts to wholes and to each other; each will require the writer to recognize and clarify what the reader is expected to bring to the writing and what he has a right to expect to be provided in the writing; each will require the writer to distinguish adequately between unordered experience (which is acquired inductively) and ordered experience (which is usually acquired and transmitted deductively). These students should finish the course with some assurance that the written language is a

controllable vehicle for moving significant facts and judgments from one mind to another and that the writer has more trustworthy tools at his disposal than a bottomless bag of gimmicks designed to "create interest" or "grab the reader."

Our non-technical student may never become an avid reader of Scientific American as a result of the course, but his reading habits are likely to become more catholic than they were, and he is apt to browse through material he previously would have rejected as incomprehensible. He isn't likely to start submitting articles to The Journal of Crystal and Molecular Structure or to Space Science Review, but he just might decide to try his newly-acquired skills in the large and rapidly growing area of popular science articles for the academic and general public audiences. I think you will all agree that there is both a need and a market for better performance in this area. When the rotary engine caught the public eye just a few years ago, for example, the popular magazines (including Reader's Digest) were quick to explain its method of operation. I read a good many of those explanations. All of them gave thorough attention to the matter of the triangular piston, but not one gave me any clear notion of how the rotating piston transferred it energy to the drive shaft of the engine. The number of Mazda automobiles I see on the streets convinces me that the energy is transferred, but I would still like to know how without having to take a rotary engine apart myself. The liberal arts student who can look at the engine and what the experts have written about it and then explain its operation so that I and laymen like me can understand will not only be in a better position to deal with the world he lives in but will be better able to find a job at a time when there is a depressed market for his ability to explain the sprung rhythm of Gerard Manly Hopkins or the metaphysical associations inherent in Cubism. He may decide

he likes such work, but if he doesn't, his training for it should at least maintain and sharpen the skills he will need when the market makes experts on Hopkins and Cubism more in demand.

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(The paper is a revised version of the one read at the twenty-sixth annual meeting of the Conference on College Composition and Communication held in St. Louis, Missouri, March 13-15, 1975.)